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ABSTRACT -- KEY POINTS

BRDF/Albedo Product

The beta-3 version of the BRDF/albedo production code was delivered to SDST on schedule after major programming work. It passed all scheduled tests by performing i/o using EOS-HDF through the SDP and M-API toolkits, using the SMF error handling facility throughout, and adhering to SDST and ECS programming requirements. The code was delivered in form of two executables processing level 2G input data formats and producing level 3 BRDF/albedo tiles. Most ancillary data read capabilities and preliminary metadata handling are provided. Algorithm development was accompanied by progress in the science underlying the algorithm. The number of BRDF models to be used was reduced to six, including a new model that was developed for modelling forward scattering surfaces.

Land Cover/Land Cover Change Product

Coding for the Beta-3 delivery was a major initiative for this period. Algorithm development and testing for the land cover and land cover change products continued with the acquisition and pre-processing of multitemporal TM for Arizona and the Walnut Gulch region of Arizona.

TASK PROGRESS

BRDF/Albedo Product

Model Development

Forward scattering land surfaces, mainly containing sub-resolution water components, were accommodated by developing a forward scattering BRDF model kernel based on a theory by Cox and Munk. The number of other BRDF kernels used for modelling of the product was reduced from 10 to 4 after analysis of MODIS/MISR sampling patterns. Including the empirical modified Walthall model, this leads to a total of six BRDF models that will be applied. This progress was reported in an update to the ATBD that was made available on the EOS-MODIS ftp site and the World Wide Web.

Model Validation

Applications of semiempirical BRDF models to field-measured and aircraft-measured data continued and aided in defining key model parameters. A manuscript on this work was prepared. Partial results

were submitted to the Geophysical Journal as part of a paper describing the MODIS BRDF/albedo products as a whole.

Beta-3 Algorithm Delivery

The largest piece of work in the reported period was the beta-3 delivery of the BRDF/albedo algorithm and the subsetting algorithm that builds the database required for this algorithm. Much of July through September were spent on this task, in close collaboration with SDST, the atmospheric correction team and the gridding specialists. All milestones set in a SDST/MODLAND meeting in late July were met. The code produced is beginning to resemble actual MODIS processing. All code uses the ECS-required SDP and SDST-required M-API toolkits to perform i/o and error handling through the smf facility. The data read is in L2G format as was produced by the code above BRDF/albedo in the processing hierarchy. Actual threading tests were completed successfully. Most ancillary data reads are available as is preliminary metadata handling.

The code consists of two executables, one preparing daily input data by subsetting it into a 16-day database, the second one producing the BRDF/albedo data product from this database. The L2G data format concept was found to be very valuable in this task. All HDF output and input formats were specified in their beta-3 form. Part of this delivery were software tools allowing flow and content testing and manipulation of HDF files, which were developed to go with the specific format of the BRDF/albedo product. Test data was produced both from field-measured BRDF data by Kimes and from the simulated SDST MODIS data set.

BRDF/Albedo at the IGARSS Conference

At the IGARSS conference in July, three talks were given concerning the BRDF/albedo product. One concerned the product as a whole, one the BRDF models used, and one validation by application to data measured in the Changchun Solar Simulation Laboratory in China. Response to these talks was very positive.

Land Cover/Land Cover Change

During this reporting period, we focused primarily on Beta-3 coding, development of the validation plan and algorithm development for land cover classification. We continued our work with advanced technology (AT) classifiers: neural nets, decision trees and adaptive classifiers. We hosted the July MODLAND Meeting at BU. We attended and presented at the Land Cover Workshop at Flathead Lake on 6-8 September.

Test Site Activities

Test site activity continued in Arizona, Walnut Gulch and BOREAS.

Walnut Gulch/Arizona

We compiled a MODIS-like data set to examine feature-selection via decision trees with neural net classifiers. A time sequence of seven selected TM datasets was co-rectified and spatially resampled to MODIS resolutions. Exploration of neural network and tree-based classifiers was temporarily halted because the quality of the ground truth information was limiting, and a new set of ground truth data was not obtained until the end of September. These efforts will continue through the first quarter of 1996.

BOREAS

We evaluated 10 flights of level-0 data from July 1994 of the Southern Study Area (SSA).

Feature Selection

Feature selection work which was begun during the last reporting period is continuing.

Neural Nets

Research on neural net classifiers continued during this period.

Algorithm Coding

Coding of the land cover algorithm required a major effort during the period. Initial coding strategies were developed early in the reporting interval.

ANTICIPATED ACTIVITIES DURING THE NEXT QUARTER

BRDF/Albedo Product

The mathematics of BRDF and albedo sampling sensitivity will be further investigated. An expert briefing on the product will be conducted in order to obtain feedback from the science community. A paper on the BRDF/albedo product will be written. BRDF/albedo validation plans will be discussed and coordinated. Beta-3 follow-ons are expected as code threading across MODLAND products continues, requiring trouble shooting and test monitoring. Model validation activity is expected to show final progress.

Land Cover/Land Cover Change Product

During the next quarter, we will expand test site activities to the 1-km NDVI dataset for the western hemisphere and especially Central America. Algorithm development and testing will include several neural nets, as well as decision trees.

PROBLEMS/CORRECTIVE ACTIONS

During this reporting period, we did not encounter any significant problems requiring corrective actions beyond the everyday problems that occur in research and algorithm development.